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PATENT APPLICATION

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Applicants : Bernd BARTHEL et al

Title : HIGH-STRENGTH EROSION ELECTRODE

Serial No. : 09/919 537 Group: 1725

Confirmation No.: 4891

Filed : July 31, 2001 Examiner: Elve

Atty. Docket No.: Missling Case 325A

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

FIRST CLASS MAILING CERTIFICATE

Sir:

I hereby certify that this correspondence is being deposited with the United States Postal Service under 37 CFR 1.8 as first class mail in an envelope addressed to: Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450, on November 18, 2003.

Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL & TANIS, P.C.
2026 Rambling Road
Kalamazoo, MI 49008-1631
Phone: (269) 381-1156
Fax: (269) 381-5465

Dale H. Thiel Reg. No. 24 323
David G. Boutell Reg. No. 25 072
Ronald J. Tanis Reg. No. 22 724
Terryence F. Chapman Reg. No. 32 549
Mark L. Maki Reg. No. 36 589
David S. Goldenberg Reg. No. 31 257
Liane L. Churney Reg. No. 40 694
Brian R. Tumm Reg. No. 36 328
Robert J. Sayfie Reg. No. 37 714
Steven R. Thiel Reg. No. 53 685
Sidney B. Williams, Jr. Reg. No. 24 949

Correspondence: Letter Transmitting Appeal Brief Fee
dated November 18, 2003
including enclosures listed thereon
and
Amendment After Final Rejection
dated November 18, 2003
including enclosures listed thereon

190.05/03

PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

November 18, 2003

Applicants: Bernd BARTHEL et al

For: HIGH-STRENGTH EROSION ELECTRODE

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LETTER TRANSMITTING APPEAL BRIEF FEE

Sir:

Enclosed is Appellants' check in the sum of $330.00, representing payment of the Appeal Brief fee. The Commissioner is hereby authorized to charge any additional fee which may be required by this paper, or to credit any overpayment, to Deposit Account No. 06-1382. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

IN DUPLICATE

Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL & TANIS, P.C.
2026 Rambling Road
Kalamazoo, MI 49008-1631
Phone: (269) 381-1156
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Encl: Check ($330)
Appellants' Brief on Appeal
Appendix

110.0703

PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

November 18, 2003

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For: HIGH-STRENGTH EROSION ELECTRODE

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APPELLANTS' BRIEF ON APPEAL

Sir:

This is an appeal from the Examiner's final rejection of Claims 3-7 and the Office Action dated May 20, 2003.

REAL PARTY IN INTEREST

Berkenhoff GMBH is the assignee of the present application and the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences to the present application.

STATUS OF CLAIMS

Claims 1-7 are pending in the present application. Claims 1 and 2 have been withdrawn from consideration as being directed to a non-elected invention. Claims 3-7 are the claims under consideration on appeal.

STATUS OF AMENDMENTS

An Amendment After Final Rejection is being filed along with the Appeal Brief.

SUMMARY OF INVENTION

Appellants' invention, as defined in independent Claim 3, is directed to an erosion electrode consisting of a patented steel core and an outer layer containing 40-60 wt.% zinc. The patented steel core has a carbon content of from 0.6-1 wt.% and occupies an area of 50-75% of the cross-sectional area of the erosion electrode (specification page 4, lines 7-12).

Claim 4 limits Claim 3 in requiring that the conductivity of the erosion electrode is at least 10 $S \cdot m/mm^2$ (specification page 2, lines 15-17).

Claim 5 limits Claim 3 in requiring that the strength of the erosion electrode is at least 1800 N/mm^2 (specification page 2, lines 15 and 16).

Claim 6 limits Claim 3 in requiring that the conductivity and the strength of the erosion electrode is from 10-18 $S \cdot m/mm^2$ and 1800-2500 N/mm^2 respectively (specification page 5, lines 31-34).

Claim 7 limits Claim 3 in requiring that the erosion electrode have a diameter of less than 10 microns (specification page 6, lines 3 and 4).

ISSUES

The sole issue presented for review is whether Claims 3-7 are unpatentable under 35 USC 103(a) over Yamamoto et al in view of ASM Glossary of Metallurgical Terms (ASM).

GROUPING OF CLAIMS

The claims do not all stand or fall together. Each of Claims 3-7 is directed to a separately patentable invention.

ARGUMENT

The presently claimed invention is based on the discovery that an erosion electrode having a steel core of a patented structure, a carbon content of 0.6-1 wt.% and occupying an area of 50-75% of the cross-sectional area of the erosion electrode, which additionally has an outer layer containing

40-60 wt.% zinc, has a high strength and deformability and comparatively high conductivity.

The presently claimed erosion electrodes can replace more expensive electrodes and still provide a cutting quality with a high degree of exactness in contours. Additionally, the erosion electrodes of the present invention are significantly cheaper to manufacture, exhibit no aging, have lower material costs, and offer a higher safety in manufacture and constant erosion characteristics when compared with prior art electrodes. Moreover, the wire electrodes of the present invention can be drawn to a diameter of below 10 microns which enables these electrodes to replace conventional tungsten and molybdenum wire electrodes which are significantly more expensive.

In comparison with conventional tungsten and molybdenum wire electrodes, the electrodes of the present invention show no aging, have lower raw material costs, offer a higher safety in manufacture and have constant erosion characteristics. The achieved quality in manufacture is so great that the wire electrodes of the present invention do not practically breakdown while being used in an erosion machine while the breakdown of conventional molybdenum and tungsten wires amount to up to 50%. In the case of erosion wires with a diameter of above 100 microns, the high strength of the presently claimed electrodes is particularly advantageous when workpieces having a greater height are to be cut since high wire tensions are required in order to keep bending and vibration of the electrodes at a low level. It is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

The Yamamoto et al reference discloses a wire electrode used in electrical discharge machining which has a core of stainless steel and a covering layer of copper or alloy thereof provided on the core. The diameter and tensile strength of the wiring electrode and percentage of the sectional area of the core to the entire wire electrode are

disclosed as being critical parameters in Yamamoto et al. The ratio of the core area to the total area of the wire is from 30-90% and the tensile strength of the wire is from 40-200 Kg/mm^2. The diameter of the wire electrode is limited to 0.05-0.4 mm because if the diameter of the wire electrode is less than 0.05 mm, there is a possibility of the wire electrode breaking under harsh conditions due to insufficient strength at normal and high temperatures. Yamamoto et al also discloses that if the tensile strength of the wire is greater than 200 Kg/mm^2, the curling tendency needed for use as a cut wire would not be obtained.

In all of the examples of the wire electrodes in Yamamoto et al, SUS 304 stainless steel having a carbon content less than 0.08 wt.% was used. The only specific example of a coating similar to the present invention was specimen 8 in Table 1 of this reference wherein "7-3 brass" was used. "7-3 brass" is a copper/zinc alloy made up of 70% copper and 30% zinc. As disclosed in Table 2 of this reference, the wire electrode of specimen 8 had a conductivity of 15%.

The presently claimed invention is distinguished from the wire electrode of Yamamoto et al in that it requires that the wire electrode have a stainless steel core that was subjected to a patenting treatment and have a carbon content of from 0.6-1 wt.%. Additionally, the brass coating of the presently claimed wire electrode is required to have a zinc content of from 40-60 wt.% and not the 30 wt.% specifically exemplified in Yamamoto et al.

The Yamamoto et al reference does not even present a showing of prima facie obviousness with respect to Claims 3-7 in that this reference does not disclose the provision of a patented steel core or that any advantage would be gained by such a structure. Additionally, as stated above, there is no specific example in Yamamoto et al of a wire electrode having a core with a carbon content of 0.6-1 wt.% and an outer layer containing 40-60 wt.% zinc. As such, Yamamoto et al in combination with ASM, which was merely cited to show that

steel generally contains less than 2.5% carbon, does not present a showing of prima facie obviousness with respect to the presently claimed invention.

Although Yamamoto et al in combination with ASM does not present a showing of prima facie obviousness with respect to the presently claimed invention, objective evidence is of record which further establishes the patentability of the presently claimed invention. Claims 4-6 require that the conductivity of the erosion electrode be at least 10 $S \cdot m/mm^2$ and the strength be at least 1800 N/mm^2. Sample No. 8 of Yamamoto et al, which is the closest electrode disclosed in this reference to the present invention, has a conductivity of only 15% and a mechanical strength of 139 Kg/mm^2, which translates to 1363 N/m^2. Since Claim 4 requires that the conductivity of the erosion electrode is at least 10 $S \cdot m/mm^2$ and the conductivity of Sample No. 8 of Yamamoto et al is only 15%, Appellants respectfully submit that the unexpectedly superior conductivity required in Claim 4 for the inventive electrode separately patentably distinguishes it over the cited prior art.

Claim 5 requires that the inventive electrode have a strength of at least 1800 N/mm^2. Sample No. 8 of Yamamoto has a mechanical strength of 1363 N/m, which is only about 76% of that required for the inventive electrode in Claim 5. Given the unexpectedly high 32% increase in strength required for the electrode of Claim 5, it is respectfully submitted that Claim 5 is separately patentably distinguishable over the prior art.

Claim 6 requires that the inventive electrode have both a conductivity of 10 $S \cdot m/mm^2$ and a strength of at least 1800 N/mm^2. The presence of both of these requirements in Claim 6 makes Claim 6 separately patentably distinct over the cited prior art for both of the reasons given above for Claims 4 and 5.

Claim 7 is even further distinguished over the prior art cited by the Examiner in that it requires that the erosion

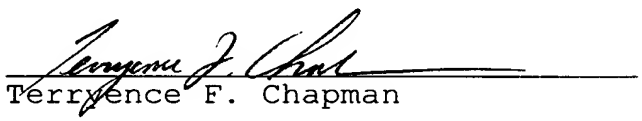
electrode have a diameter of less than 10 microns. The smallest diameter permitted in Yamamoto et al is 50 microns. As such, Claim 7 is even further distinguished from the disclosure of the references cited by the Examiner.

CONCLUSION

For the reasons advanced above, it is respectfully submitted that the presently claimed invention is clearly patentably distinguishable over the prior art cited by the Examiner. Reversal of the Examiner is respectfully solicited.

Respectfully submitted,

IN TRIPLICATE



Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL & TANIS, P.C.	Dale H. Thiel	Reg. No. 24 323
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Encl: Appendix

110.0703

APPENDIX

3. An erosion electrode consisting of a patented steel core and an outer layer containing 40-60 wt.% zinc, said patented steel core having a carbon content of 0.6 to 1 wt.% and occupying an area of 50 to 75% of the cross-sectional area of the erosion electrode.

4. The erosion electrode according to Claim 3, wherein the conductivity of the erosion electrode is at least 10 $S \cdot m/mm^2$.

5. The erosion electrode according to Claim 3, wherein the strength of the erosion electrode is at least 1800 N/mm^2.

6. The erosion electrode according to Claim 3, wherein the conductivity and the strength of the erosion electrode is from 10-18 $S \cdot m/mm^2$ and 1800-2500 N/m^2 respectively.

7. The erosion electrode according to Claim 3, wherein the erosion electrode has a diameter of less than 10 μm.